

REMARKS

Claims 1–18 are pending in this application. Claims 1 and 11 are amended herein. Claim 2 has been cancelled.

The claims stand rejected for being indefinite for failing to particularly point out and distinctly claim the subject matter that is regarded as the invention and as being obvious. The individual rejections will be addressed below in the order presented in the Final Office Action.

Support for Claim Amendments

The amendments presented above have been made to recite particular features of the inventions so as to expedite the prosecution of the present application to allowance in accordance with the USPTO Patent Business Goals (65 Fed. Reg. 54603, September 8, 2000). These amendments do not represent an acquiescence or agreement with any of the outstanding rejections.

Claims 1 and 11 have been amended to recite: "...wherein a separation zone is disposed between said anion exchange membrane and said cation exchange membrane..." This recitation has support in paragraph 42 of the Specification. Additionally, matter previously claimed in claim 2 has been incorporated into claims 1 and 11.

I. Priority

A certified copy of Japanese Patent Application No. 2000-182612, filed on June 19, 2000, is submitted concurrently herewith as required by 35 U.S.C. § 119(b)

II. Claim Rejections-35 USC § 112

Claims 1–18 stand rejected under 35 USC § 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter that Applicant regards as the invention.

Claims 1 and 11 recite the limitation "having catalyst layers on both sides thereof." The Examiner asserts that this language is of uncertain meaning, thereby rendering the claims

indefinite. Claims 1 and 11 have been amended to recite "...wherein a catalyst layer and hydrogen electrode is disposed on one surface of said anion exchange membrane and a catalyst layer and oxygen electrode is disposed on the other surface of said anion exchange membrane, wherein a catalyst layer and hydrogen electrode is disposed on one surface of said cation exchange membrane and a catalyst layer and oxygen electrode is disposed on the other surface of said cation exchange membrane..." to define and clarify the disposal of the catalyst layers on the cation exchange membrane and the anion exchange membrane.

In view of the foregoing, Applicants submit that claims 1–18 satisfy the requirements of 35 U.S.C. § 112, second paragraph and respectfully request that the rejections on this basis be withdrawn.

IV. Claim Rejections-35 USC § 103

Claims 1–18 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,127,059 to Kato (hereinafter the '059 patent), in light of U.S. Patent No. 6,103,078 to Hitchems et al. (hereinafter the '078 patent).

The Examiner states that the instant claims are directed to solid polymer fuel cells wherein the claimed inventive concept comprises the specific exchange membrane material employed therein, with additional limitations including gas passages, polymer materials, carbon paper and membrane positioning.

The Examiner argues that the '059 to Kato discloses a solid polymer fuel cell and exchange membrane sandwiched between catalyst layers (FIG. 2 and column 6, lines 32–42 of the specification) and gas diffusion layers comprising carbon paper (column 1, lines 45–47 of the specification) or carbon fiber woven cloth (column 5, line 44 of the specification). However, the '059 patent does not expressly disclose a solid polymer fuel cell comprising an anion exchange membrane and a cation exchange membrane, the membrane materials, the channels and the fuel cell stack (page 4, last paragraph, Final Office Action (paper 9)).

The Examiner argues that the '078 patent to Hitchems et al. discloses membranes with fluid distribution passages, wherein the membrane "may be formed of a single ionically conducting material, such as a cation-conductive or anion-conductive membrane," (lines 6–9 of the abstract) or wherein the membrane can be a bipolar membrane wherein the cation-exchange membrane may be bonded to the anion exchange membrane by any method. The

Examiner then argues that it would have been obvious to one skilled in the art at the time the invention was made to make the solid polymer electrolyte (bipolar membrane) of the '078 patent to Hitchems et al. in the fuel cell of the '059 patent Kato as the '078 patent teaches that bipolar membranes can be used as proton exchange membranes for fuel cell applications of the present invention. Applicants respectfully disagree.

Applicants assert that it is not obvious in light of the '059 and '078 patents to use cation exchange membranes and anion exchange membranes in a fuel cell of the present invention as argued by the Examiner. The '059 patent discloses a single cell fuel cell. However, it does not disclose that an anion exchange membrane and a cation exchange membrane can be used together in a fuel cell. Such is admitted by the Examiner in the last paragraph on page 4 of the Final Office Action (paper 9). Furthermore, advantages and features of the fuel cell of the present invention, i.e., solving the problem of deterioration of a proton exchange membrane due to drying, and providing a self-humidifying type fuel cell, are not suggested in either the '059 or the '078 patent.

The '078 patent discloses a process for producing improved membranes with fluid distribution passages, which can be formed of a single ionically conducting material, such as a cation exchange or anion exchange membrane, or with a plurality of ionically conductive material, such as in a bipolar membrane.

In column 14, lines 43–54, the '078 patent states:

“In the bipolar membrane of the present invention, the cation-exchange membrane may be bonded to the anion-exchange membrane by any method. However, it is preferred that the cation-exchange membrane and the anion-exchange membrane be adhered closely to each other at a peel strength of not less than 0.2 kg-f/25 mm in a wet state to prevent separation of both the membranes when the bipolar membrane is in the wet state, such as in water splitting. This also applies to applications where the membranes are of like charge, such as proton exchange membrane (PEM) fuel cells...”

Thus the '078 patent teaches that membranes with fluid distribution passages formed with a single ionically conducting (cation-exchange) material have applications in PEM fuel cells. Applicants present that the '078 patent does not teach that bipolar membranes can be used or applied PEM fuel cells, rather, the '078 patent teaches that only ionically conducting membranes having internal passages formed from membranes of like charge, e.g., cation

exchange membranes, as disclosed in the '078 patent, and that these membranes, and not bipolar membranes, merely have applications in PEM fuel cells.

Applicants present that the use of the bipolar membrane of the '078 patent in PEM fuel cells does not solve the problem of deterioration of a proton exchange membrane due to drying, or providing a self-humidifying type fuel cell. One skilled in the art will appreciate that the bipolar membrane of the '078 patent cannot replace the membrane 11 in FIG. 2 of the '059 patent in order to produce fuel cells and provide the advantages of the present invention, i.e., prevent deterioration of the proton exchange membrane due to drying and provide a self-humidifying type fuel cell.

Applicants assert that in the present invention, a catalyst layer and a hydrogen electrode is disposed on one side of the anion exchange membrane, and a catalyst layer and an oxygen electrode is disposed on the other side of the anion exchange membrane, and a catalyst layer and a hydrogen electrode is disposed on one side of the cation exchange membrane and a catalyst layer and an oxygen electrode is disposed on the other side of the cation exchange membrane. In contrast, catalyst layers cannot be disposed on both sides of the anion and cation exchange membranes that constitute the bipolar membrane of the '078 patent. Thus the '078 patent does not teach the recited disposal of catalyst layers on the anion and cation exchange membranes of the present invention.

Furthermore, Applicants present that the anion exchange membrane and the cation exchange membrane of the present invention do not comprise a bipolar membrane as disclosed in the '078 patent. In the present invention, the anion exchange membrane and the cation exchange membrane are disposed with a separation zone between them, whereby they do not form one membrane. Therefore the '078 patent does not teach the use of the ion exchange membranes of the present invention in PEM fuel cells. As the '059 patent does not teach every aspect of the present invention and the '078 patent does not teach the use of the ion exchange membranes of the present invention in PEM fuel cells, it cannot be obvious to one skilled in the art to make the present invention in light of the '059 and '078 patents.

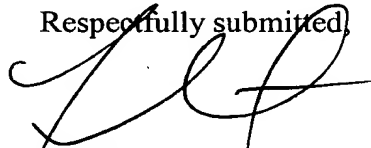
In view of the forgoing, Applicants submit that claims 1–18 are unobvious and respectfully request that the § 103(a) rejections be withdrawn.

In re: Ito
Application Serial No. 09/884,002
Filed: June 18, 2001
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V. Conclusions

The points and concerns raised by the Examiner in the outstanding Office Action have been addressed in full, it is respectfully submitted that this application is in condition for allowance. Should the Examiner have any remaining concerns, it is respectfully requested that the Examiner contact the undersigned Attorney to expedite the prosecution of this application to allowance.

Respectfully submitted,



F. Michael Sajovec, Esq.
Registration No. 31,793

USPTO Customer No. 20792
Myers Bigel Sibley & Sajovec, P.A.
Post Office Box 37428
Raleigh, NC 27627
Telephone (919) 854-1400
Facsimile (919) 854-1401

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Clara R. Beard